Remarks

In view of the above amendments and the following remarks, reconsideration of the rejections and further examination are requested.

Claims 15, 17, 19, 20, 22 and 25-28 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Call (US 5,309,461) in view of Kimbrough (US 6,707,833).

Claim 15 has been amended so as to include limitations similar to those previously contained in claim 20, and claim 20 has been cancelled without prejudice or disclaimer to the subject matter contained therein. As a result, the rejection is respectfully traversed and submitted to be inapplicable to the claims for the following reasons.

Claim 15 is patentable over the combination of Call and Kimbrough, since claim 15 recites a semiconductor laser driving device including, in part, a high-frequency superimposing control section for controlling an amplitude of a high-frequency signal, wherein the high-frequency superimposing control section is operable to control the amplitude of the high-frequency signal such that a peak-to-average ratio that is a ratio of a peak value of an electric signal with respect to an average value of the electric signal does not increase above a first reference value, and wherein the high-frequency superimposing control section is operable to control the amplitude of the high-frequency signal such that the amplitude decreases to lower the peak-to-average ratio as the average value increases, if the average value is less than a threshold value, and the amplitude increases to raise the peak-to-average ratio as the average value increases, if the average value is larger than the threshold value.

Based on the above recitation of claim 15, it is apparent that the semiconductor laser driving device irradiates the optical recording medium with light emitted from the semiconductor laser for performing an operation of, for example, recording, reproducing, or erasing information on the optical recording medium. Therefore, the average value of the light emitted from the semiconductor laser is changed according to the type of optical recording medium and/or the operation performed on the optical recording medium.

Further, the high-frequency superimposing control section controls the amplitude of the high-frequency signal in such a manner that the amplitude decreases to lower the peak-to-average ratio of an electric signal corresponding to a light amount, if the average value of the electric signal is less than a threshold value, and the amplitude increases to raise the peak-to-average ratio, if the average value is larger than the threshold value, so that the peak-to-average

ratio does not increase above a first reference value. Therefore, proper amplitude control is realized that reflects the relationship between the peak-to-average ratio and the average value. Specifically, when the average value of the light emitted from the semiconductor laser varies, it becomes possible to prevent deterioration in a reproduction signal at the time of reproducing information from the optical recording medium and to perform stable reproduction over a long period of time. The combination of Call and Kimbrough fails to disclose or suggest the high-frequency superimposing control section as recited in claim 15.

Call discloses a feedback system for controlling a laser 14. The feedback system includes a photodiode 31 that receives an auxiliary beam from the laser 14 and outputs a photo-current amplitude corresponding to the light power of the auxiliary beam. A laser control 15 receives the photo-current amplitude from the photodiode 31 and uses the photo-current amplitude to control the laser 14 so as to maintain predetermined light intensity values. (See column 3, lines 35-48 and Figure 1).

Further, Call discloses that semiconductor lasers are sensitive to laser light feedback which changes the output laser power and increases laser noise. In order to limit laser light feedback, it is possible to modulate the laser with a high frequency signal, such that the laser is turned off when it receives reflected light and turned back on once the reflected light has passed. However, the modulation depth must be controlled to adequately control laser noise. (See column 3, lines 48-61).

Based on the above discussion, it is apparent that Call does disclose that controlling the modulation depth of a laser can be used to reduce laser noise. However, as admitted in the rejection, Call fails to disclose or suggest controlling an amplitude of a high-frequency signal such that a peak-to-average ratio that is a ratio of a peak value of an electric signal corresponding to a light amount of light from a semiconductor laser with respect to an average value of the electric signal does not increase above a first reference value. Further, Call fails to disclose or suggest controlling the amplitude of the high-frequency signal such that the amplitude decreases to lower the peak-to-average ratio as the average value increases, if the average value is less than a threshold value, and the amplitude increases to raise the peak-to-average ratio as the average value increases, if the average value is larger than the threshold value. As a result, Kimbrough is relied upon as disclosing these features.

Regarding Kimbrough, it relates to the field of optical communication circuits using laser diodes. In the optical communication circuit, the laser diode is pulsed on and off in order to communicate pulses of light over an optical fiber. Therefore, it is necessary to maintain the light emitted from the laser diode at a constant average optical power level.

Kimbrough discloses a digital feedback loop 40 that is coupled between a photodiode 66B and a digital synthesizer 60. The digital feedback loop 40 includes comparators 168A, 168B that receive the peak value of an electric signal transmitted from the photodiode 66B and upper and lower limit values based on a reference voltage VR. The comparators 168A, 168B compare the upper limit value and the peak value and the lower limit value and the peak value, and the results of the comparison are then used by the digital synthesizer 60 to control the amplitude such that the peak value is within the upper and lower values. (See column 3, lines 30-53; column 4, lines 9-27; and Figure 3).

Based on the above discussion, it is apparent that the digital feedback loop 40 and the digital synthesizer 60 of Kimbrough merely lower the amplitude if the peak value is larger than the upper limit value, and raise the amplitude if the peak value is less than the lower limit value. Unlike the high-frequency superimposing control section recited in claim 15, the amplitude in Kimbrough is not controlled in such a manner that the amplitude decreases to lower the peak-to-average ratio, if the average value of output of the semiconductor laser is less than a threshold value, and the amplitude increases to raise the peak-to-average ratio, if the average value is larger than the threshold value, so as to prevent the peak-to-average ratio from increasing above a first reference value. Therefore, since Kimbrough does not disclose or suggest a high-frequency superimposing control section having the above-described characteristics of claim 15, it fails to address the deficiencies of Call. As a result, the combination of Call and Kimbrough does not render claim 15 obvious.

Regard Sakamoto, it is relied upon as disclosing a temperature sensor and a storing section. However, Sakamoto fails to disclose or suggest the high-frequency superimposing control section of claim 15.

Claim 18 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Call in view of Kimbrough and further in view of Sakamoto (US 5,005,164). However, as mentioned above, this combination of references fails to disclose or suggest the high-frequency

superimposing control section of claim 15. As a result, claim 18 is patentable over the combination of Call, Kimbrough and Sakamoto as being dependent from claim 15.

Further, claim 18 recites that the high-frequency superimposing control section reads out data indicative of a relationship of the average value of the electric signal, the temperature of the semiconductor laser, the amplitude of the high-frequency signal, and the peak-to-average ratio to control the amplitude of the high-frequency signal based on the data, the average value, and the temperature. Therefore, control of the amplitude of the high-frequency signal taking in consideration of the change in the temperature of the semiconductor laser can be realized.

On the other hand, Sakamoto, which is relied upon in the rejection as disclosing the features of claim 18, discloses measurement of a temperature of the semiconductor laser, detection of a deviation between an optimum laser power for the temperature measurement and an actually measured laser power, and compensation of laser power to eliminate the temperature deviation. (See column 15, lines 13-25). However, Sakamoto does not disclose or suggest a high-frequency superimposing control section having the above-described characteristics of claim 18. As a result, claim 18 is patentable over the combination of Call, Kimbrough and Sakamoto.

Because of the above-mentioned distinctions, it is believed clear that claims 15, 17, 19, 22 and 25-28 are allowable over the references relied upon in the rejections. Furthermore, it is submitted that the distinctions are such that a person having ordinary skill in the art at the time of invention would not have been motivated to make any combination of the references of record in such a manner as to result in, or otherwise render obvious, the present invention as recited in claims 15, 17, 19, 22 and 25-28. Therefore, it is submitted that claims 15, 17, 19, 22 and 25-28 are clearly allowable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. The Examiner is invited to contact the undersigned by telephone if it is felt that there are issues remaining which must be resolved before allowance of the application.

Respectfully submitted,

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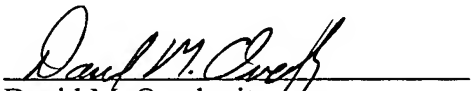
By: 

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